International Mathematical Talent Search – Round 17

Problem 1/17. The 154–digit number, $19202122\ldots939495$, was obtained by listing the integers from 19 to 95 in succession. We are to remove 95 of its digits, so that the resulting number is as large as possible. What are the first 19 digits of this 59–digit number?

Problem 2/17. Find all pairs of positive integers (m, n) for which $m^2 - n^2 = 1995$.

Problem 3/17. Show that it is possible to arrange in the plane 8 points so that no 5 of them will be the vertices of a convex pentagon. (A polygon is convex if all of its interior angles are less than or equal to $180°$.)

Problem 4/17. A man is 6 years older than his wife. He noticed 4 years ago that he has been married to her exactly half of his life. How old will he be on their 50th anniversary if in 10 years she will have spent two-thirds of her life married to him?

Problem 5/17. What is the minimum number of 3×5 rectangles that will cover a 26×26 square? The rectangles may overlap each other and/or the edges of the square. You should demonstrate your conclusion with a sketch of the covering.